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Amended Patent Claims

1. An undulator characterized by comprising:
   - a first magnetic circuit (11) for forming a periodic magnetic field;
   - a first support body (21) for supporting the first magnetic circuit (11);
   - a second magnetic circuit (12) arranged so as to be opposite to the first magnetic circuit (11), for forming a periodic magnetic field;
   - a second support body (22) for supporting the second magnetic circuit (12);
   - a space (13) formed between the oppositely arranged first and second magnetic circuits (11, 12), for passing an electron beam;
   - a vacuum chamber (1) for in-vacuuming the first magnetic circuit (11) and the second magnetic circuit (12); and
   - a cooking mechanism (30) for cooling a permanent magnet (m) constituting the first magnetic circuit (11) and the second magnetic circuit (12) below the room temperature.

2. The undulator according to claim 1,
   further comprising:
   - a gap changing mechanism for changing a gap (g) of the space (13);
   - a refrigerant passing tube (30) provided in the cooling mechanism, for passing a refrigerant; and
   - a connecting component (31) for connecting the refrigerant passing tube (30) to each of the first support body (21) and the second support body (22),
   - wherein the connecting component (31) has flexibility and allows the gap changing mechanism to change the gap (g).

3. The undulator according to claim 1 or 2,
wherein the cooling mechanism comprises:
- a first refrigerant passing tube (30A) provided to cool the first magnetic circuit (11), for passing the refrigerant; and
- a second refrigerant passing tube (30B) provided to cool the second magnetic circuit (12), for passing the refrigerant, wherein the first refrigerant passing tube (30A) is fixed to the first support body (21) and the second refrigerant passing tube (30B) is fixed to the second support body (22).

4. The undulator according to claim 1 or 2,
wherein the cooling mechanism comprises:
- a first refrigerant passing tube (30A) provided to cool the first magnetic circuit (11), for passing the refrigerant; and
- a second refrigerant passing tube (30B) provided to cool the second magnetic circuit (12), for passing the refrigerant, wherein the first refrigerant passing tube (30A) penetrates the inside of the first support body (21) and the second refrigerant passing tube (30B) penetrates the inside of the second support body (22).

5. The undulator according to claim 1, comprising:
- a gap changing mechanism for changing a gap (g) of the space (13);
- a cooling head (330) provided in the cooling mechanism and cooled by a freezing machine (33), and
- a connecting component (31A, 31B) for connecting the cooling head (330) to each of the first support body (21) and the second support body (22),
- wherein the connecting component (31A, 31B) has flexibility and allows the gap changing mechanism to change the gap (g).

6. The undulator according to any one of claims 1 to 5, wherein a hollow part is formed in each of a first support shaft (14) for supporting the first support body (21) and a second support shaft (15) for supporting the second support body (22).

7. The undulator according to any one of claims 1 to 6, comprising:

- a first temperature sensor (21d) for detecting a temperature of the first magnetic circuit (11);
- a first heater (21c) for heating the first magnetic circuit (11);
- a second temperature sensor (22d) for detecting a temperature of the second magnetic circuit (12);
- a second heater (22c) for heating the second magnetic circuit (12); and
- a temperature control unit (23) for controlling the first heater (21c) and the second heater (22c) on the basis of temperature measured data provided by the first and second temperature sensors (21d, 22d).

8. The undulator according to any one of claims 1 to 7, characterized in that each of the first support body (21) and the second support body (22) has a holder (21a, 22a) for mounting the permanent magnet (m), and a holder support (21b, 22b) for supporting the holder (21a, 22a), and in that the material of the holder (21a, 22a) has a thermal expansion coefficient greater than or equal to that of the holder support (21b, 22b).